

10 Things That Neurologists Should Know About Neuromodulation

Neuromodulation is a rapidly growing area of medicine. With many applications already FDA approved, and still more considered experimental, neuromodulation has significant therapeutic implications for the field of neurology.

Neuromodulation encompasses the application of targeted electrical, chemical, or biological technologies to the nervous system to relieve pain and improve function and quality of life. The appropriate therapy—low-level electrical pulses or microdoses of medication—are targeted to nerves along the spinal cord to block pain signals to the brain.

To get the basics on neuromodulation, *Neurology Reviews* spoke with Joshua Prager, MD. Dr. Prager is Past President and Senior Advisor to the Board of the North American Neuromodulation Society (NANS) and Director of the Center for Rehabilitation of Pain Syndromes at UCLA, where he is a member of the Departments of Internal Medicine and Anesthesiology. Dr. Prager offered 10 things neurologists should know about neuromodulation.

1. Neuromodulation alleviates or lessens pain, tremors, and spasticity without putting patients into a "drug fog."

By relieving pain with neurostimulation or intrathecal delivery of drugs, some side effects can be avoided, including excessive sedation and mental clouding. "If we're talking about neuromodulation for pain or for movement disorders, we have either electricity or we have minute amounts of drugs specifically targeted into the spinal fluid," Dr. Prager said. "If you use electricity, then you are not using medication. So there's certainly no 'drug fog' there. Regarding drugs, the rule of thumb conversion is that one three-hundredth (1/300) of the amount of medication you would give by mouth has the same effect in the spinal fluid. Since patients are getting a much smaller dose, the brain is not seeing anywhere near as much drug," and consequently sedation and side effects are lessened or avoided.

2. Potential neuromodulation patients can "test drive" the modality.

"Unlike spinal surgery, nerve decompression surgery, or nerve destruction surgery, neuromodulation is fully testable by performing a trial to find out if it's going to work or not," Dr. Prager said. It is possible to completely simulate what it would be like if the device was implanted. "This is done totally without incision by placing a temporary device through a needle and then taking it out in the office." For drug pumps, the simulated test typically lasts from one day to several days; for electrical stimulation, the test is typically seven days.

3. Neuromodulation is FDA approved and has been used in practice for two decades.

FDA-approved neurologic applications include spasticity, complex regional pain syndrome, chronic back pain, reflex sympathetic dystrophy, and the tremor of Parkinson's disease. Other neurologic and neuropsychiatric applications are still experimental.

4. Neuromodulation can be applied through different techniques.

Neuromodulation comprises four treatment modalities: electrical stimulation of the spinal cord, delivery of medicine into the spinal fluid, electrical stimulation of peripheral nerves, and stimulation of the motor cortex and deep brain. "If we're dealing with spasticity," Dr. Prager explained, "we give baclofen in the spinal fluid. For pain, we're talking about either spinal cord stimulation or minute amounts of analgesics in the spinal fluid. For the tremor of Parkinson's disease, deep brain stimulation would be used."

5. The implants can be removed.

Once the device is implemented, if the patient chooses to stop treatment or if

the problem for which the device was implanted resolves, the device can be removed. The procedure is entirely reversible.

6. Neuromodulation improves the quality of life for patients in pain.

"If you improve your patients' pain, their quality of life immediately improves. And activities of daily living improve. There are numerous case studies demonstrating this," Dr. Prager said. "If cognitive function improves and pain decreases, patients may titrate themselves up to higher levels of activity." To get the biggest benefit, Dr. Prager suggested four weeks of aggressive functional rehabilitation once the pain or movement problem is better controlled.

7. There are neuromodulation experts in your area.

There are about 600 members of NANS nationwide. Members include physicians of different backgrounds, all of whom specialize in pain, spasticity, and movement disorders. "The best way to find a specialist is to contact NANS, but this is no guarantee of quality." Dr. Prager recommends that neurologists looking to refer a patient ask a few pertinent questions, such as what kind of infrastructure does the physician have and what is his or her experience in terms of number of patients.

8. Neuromodulation procedures are covered by most medical insurance and Medicare plans.

As with all medical procedures, patients must check with their insurance plan. Prior authorization is often required, but, according to Dr. Prager, Medicare doesn't require prior authorization for patients who meet implant criteria.

9. Deep brain stimulation for the tremor of Parkinson's disease minimizes the need for systemic medication; intrathecal baclofen can relieve intractable spasticity without systemic side effects.

FDA-approved neuromodulation for these conditions provides not only symptomatic relief but also has systemic advantages over other available treatments. "Intrathecal baclofen has been FDA approved for more than 15 years and produces dramatic results in spasticity of both cerebral and spinal origins, including stroke, cerebral palsy, spinal cord injury, and multiple sclerosis," Dr. Prager added.

10. Neuromodulation is not science fiction.

New scientific advances and expanding clinical indications will continue to fuel the growth of this field. "If you think about where cell phones were in 1987 and where they are now in terms of what they do, it's like the stimulator devices—how much smaller they are, how much longer their batteries last, how much more robust the programming is, how many more things they can do now compared to what they did 25 years ago."

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May 2010

Neurology Reviews

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